

## ANOMALIES IN CORNICLES OF APHIDS (HOMOPTERA: APHIDIDAE)

LOUISE M. RUSSELL AND MANYA B. STOETZEL

Systematic Entomology Laboratory, Plant Sciences Institute, USDA, ARS, Beltsville, Maryland 20705.

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*Abstract.*—Anomalies in number, size, shape, and other characteristics of cornicles (siphunculi) of aphids are described and illustrated. Variations range from complete absence of cornicles to a total of four in species that normally have two cornicles.

*Key Words:* Aphididae, cornicles, anomalies, aphids

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This article portrays assorted anomalies in cornicles (siphunculi) of aphids. The recorded aberrations occur in 14 species that typically have two similar, tubelike cornicles and in one species that has truncate cornicles. Abnormalities in cornicles occur infrequently but they are not rare, and they are seldom mentioned in literature, a condition that appears to justify a short treatment of the subject.

Modifications in cornicles may be in numbers, size, shape, imbrications, reticulations, apical openings, and flanges. Variations in number are less frequent than other abnormalities. Flanges are absent when apices of cornicles are almost or completely closed. The closing of cornicle apices doubtless is detrimental to survival of the insects, as was indicated by Dixon and Stewart (1975) who stated that exudates from the cornicles drove away predators. Earlier, Nault, Edwards and Styer (1973) indicated that cornicles of certain species emit pheromones that repel other insects from feeding sites.

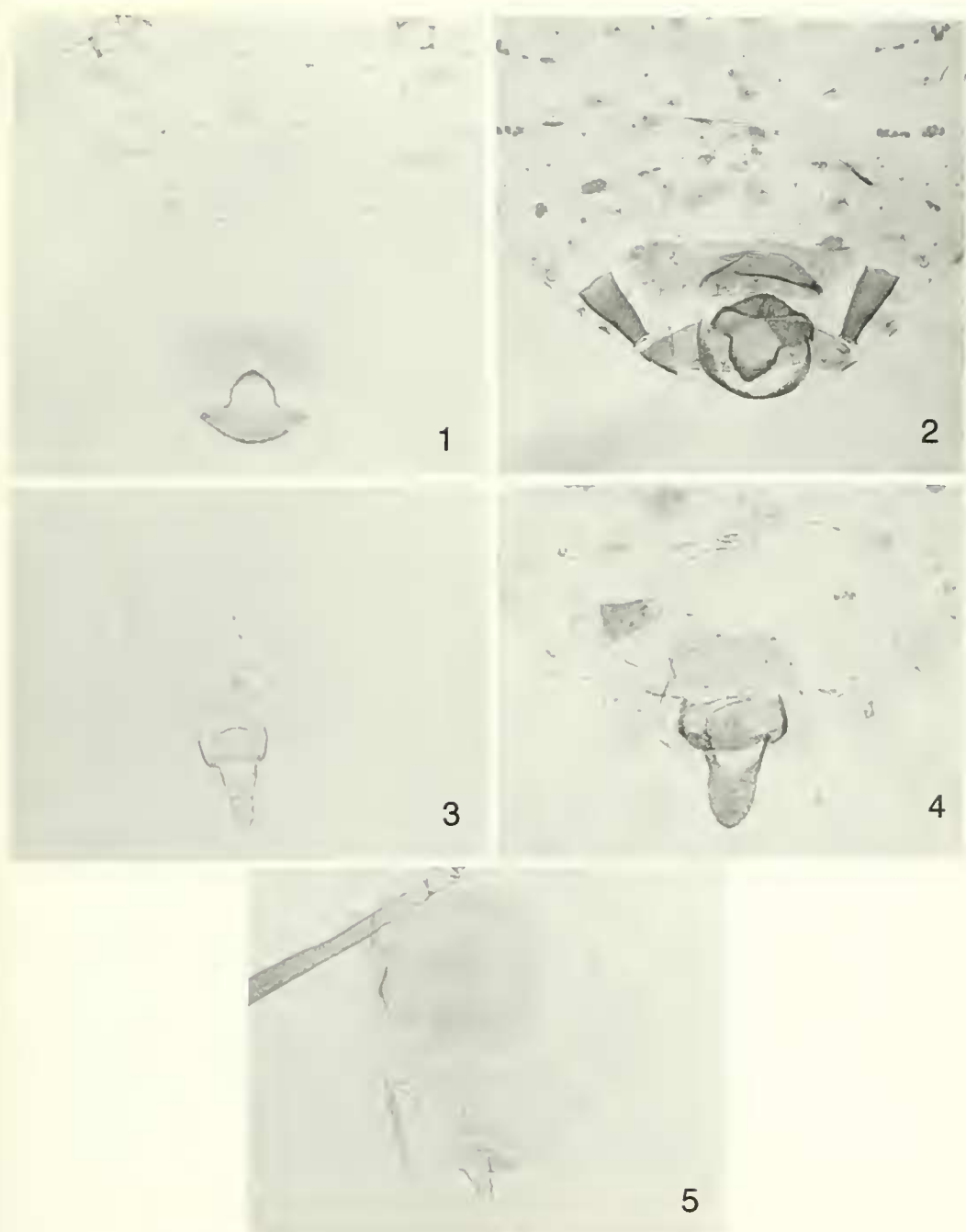
Abnormalities are sometimes present in more than one individual of a collection and other abnormalities may occur in specimens with modified cornicles. We noted aborted antennae in two species with abnormal cornicles.

### SPECIES WITHOUT CORNICLES

One intermediate vivipara of *Dysaphis foeniculus* (Theobald) (Fig. 1) (on *Daucus carota* L., Heyden Trust, Sandy's Parish, Bermuda, 24-III-1988, D. J. Hillburn, M. J. Mello, M. B. Stoetzel) is devoid of cornicles, while other specimens (Fig. 2) of the lot have two normal ones.

### SPECIES WITH ONE CORNICLE

An alate vivipara of *Hyalopterus pruni* (Geoffroy) (Fig. 3) (on an unidentified plant, Bombay Hook, Delaware, 25-VI-1975, G. Angelet) has one typical cornicle. An apterous vivipara of *Aphis masoni* Richards (Fig. 4) (sweeping mixed meadow, Churchill, Manitoba, Canada, 24-VII-1975, A. G. Robinson) also has one normal cornicle. In an alate vivipara of *Myzus ascalonicus* Doncaster (Fig. 5) (on *Sedum* sp., England, intercepted at Seattle, Washington, 8-V-1972, J. D. Kail), the one cornicle is  $\frac{1}{8}$  shorter and more slender than the cornicles in another alata from the same collection; it is slender throughout, irregular in shape, and rounded apically with a minute opening. Stoetzel (1986) apparently was the first to record the presence of only one cornicle in an aphid, *Cinara terminalis* (Gillette and Palmer).



Figs. 1-2. *Dysaphis foeniculus*. 1, Intermediate vivipara without cornicles. 2, Apterous vivipara from same collections with normal cornicles.

Fig. 3. *Hyalopterus pruni*. Alate vivipara with only one cornicle.

Fig. 4. *Aphis masoni*. Apterous vivipara with only one cornicle.

Fig. 5. *Myzus ascalonicus*. Alate vivipara with only one cornicle.

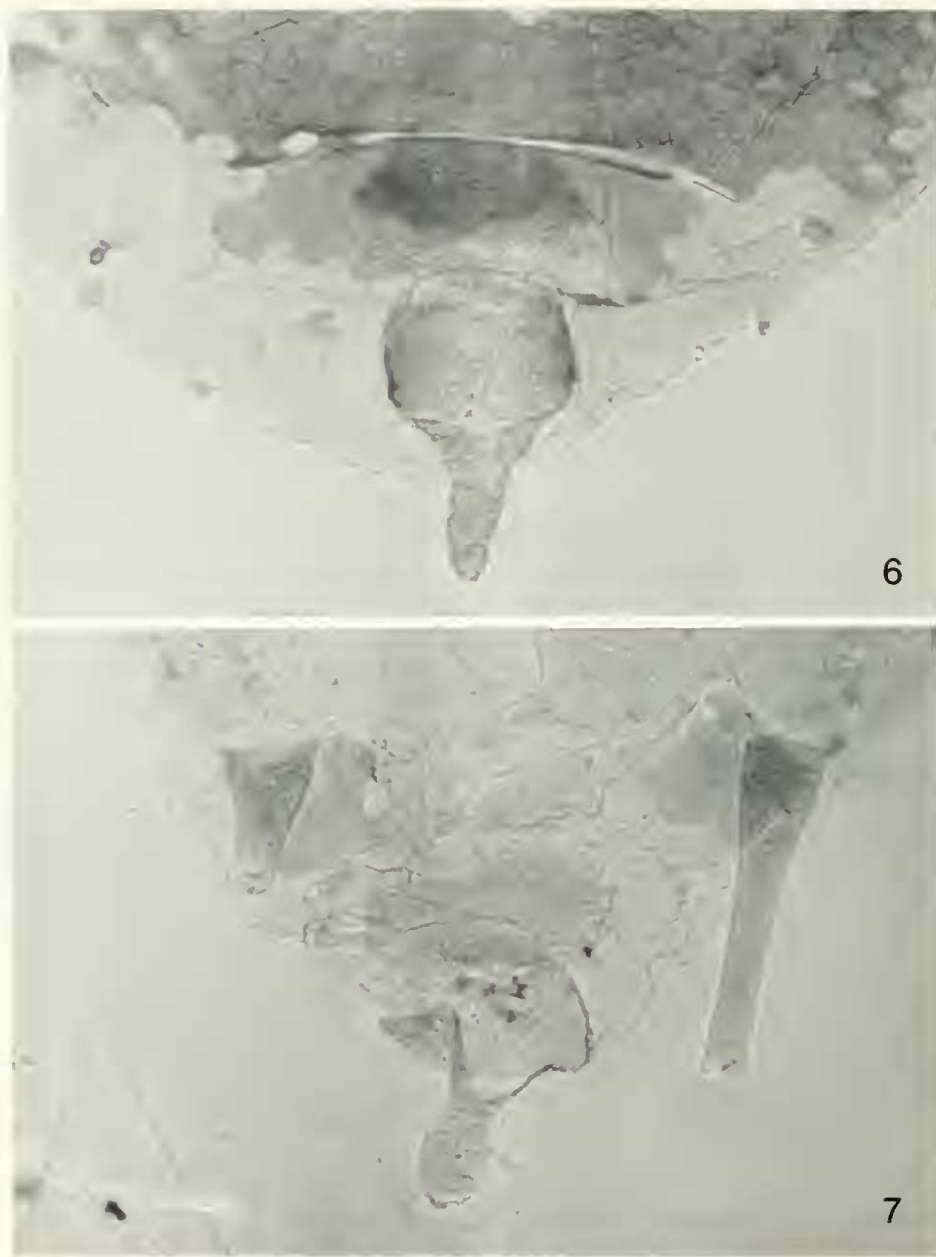


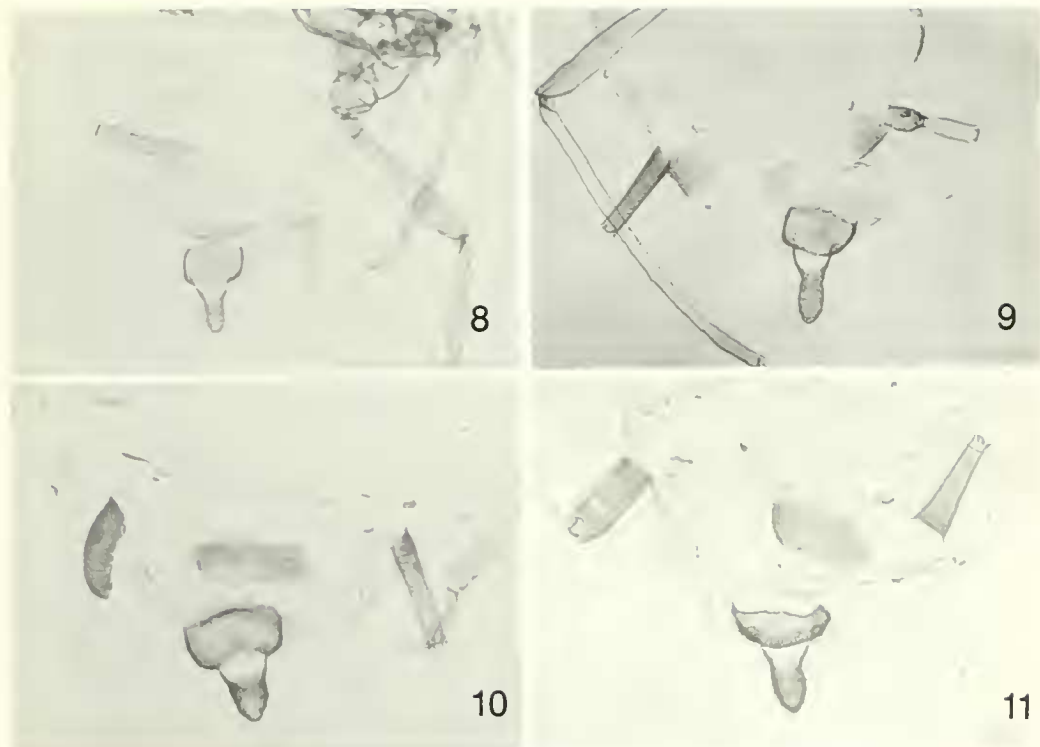
Fig. 6. *Aphis craccivora*. Apterous vivipara with dwarfed, nipple-shaped cornicles.

Fig. 7. *Aphis spiraccola*. Alate vivipara with one cornicle shortened and rounded apically.

#### SPECIES WITH TWO CORNICLES

When two cornicles are present, one or both may be modified. In an apterous vivipara of *Aphis craccivora* Koch (Fig. 6) (on

*Verbascum thapsus* L., Athens, Georgia, 4-V-1973, O. R. Pagus), both cornicles are most unusual in that they are no longer than their basal diameters and are nipple-shaped, with apices closed. In an alate vivipara of



Figs. 8-9. *Aphis spiraecola*. 8, Alate vivipara with one cornicle narrowed at midlength. 9, Alate vivipara with one cornicle strongly constricted just proximad of midlength.

Figs. 10-11. *Aphis fabae*. 10, Apterous vivipara with one cornicle curved and unusually stout. 11, Apterous vivipara with one cornicle abnormally wide and with a conspicuous hole in its lower surface.

*Aphis spiraecola* Patch (Fig. 7) (on *Prunus lyonii* (Eastw.) Sarg., Arcadia, California, 22-III-1966, H. G. Walker), one cornicle is about  $\frac{1}{2}$  the length of the normal one, is rounded, and apparently is closed apically. An alate vivipara of *Aphis spiraecola* Patch (Fig. 8) (on *Taxodium distichum* (L.) L. Rich., Chevy Chase, Maryland, 1-VI-1976, E. J. Hambleton) has one cornicle that tapers to its midpoint and then enlarges to its end; it is slightly shorter than the normal one, has few imbrications, and its apex has an opening but lacks a flange. Another alate vivipara of *A. spiraecola* (Fig. 9) (on *Malus* sp., Princess Anne, Maryland, 20-VI-1968, C. W. McComb) has one cornicle of nearly normal length that is strongly constricted just proximad of its midlength, has very few imbrications, and has a typical apical open-

ing but lacks a flange. A second alate vivipara (not shown) of this collection has one cornicle that is  $\frac{1}{2}$  the length of the normal one, has few imbrications, and is rounded and closed apically. An apterous vivipara of *Aphis fabae* Scopoli (Fig. 10) (on *Papaver orientale* L., Polur, Iran, 16-VII-1974, G. Buckingham) has a curved cornicle that is somewhat shorter and stouter than the normal one and apparently is closed apically. In another apterous vivipara of *A. fabae* (Fig. 11) (on *Papaver* sp., Greeley, Colorado, IX-1932, W. J. Zaumeyer), one cornicle is slightly shorter than the other and has a subcircular hole in its lower surface; it has a slight indication of a flange.

An apterous vivipara of *Myzus persicae* (Sulzer) (Fig. 12) (on *Blechnum occidentale* L., Arcadia, California, 26-III-1969, H. G.



Figs. 12-13. *Myzus persicae*. 12, Apterous vivipara with one cornicle shortened and club-shaped. 13, Alate vivipara with one cornicle finger-shaped and one somewhat thimble-shaped.

Walker) has a shortened, club-shaped cornicle that is closed apically. In an alate vivipara of *M. persicae* (Fig. 13) (from yellow pan trap, Fort Kent, Maine, 25-VII-1974, F. R. Holbrook), both cornicles are much less than normal length; one is somewhat thimble-shaped and the other finger-shaped; they have few imbrications and their apices are closed. Antennae of this insect terminate abruptly at the end of the fifth segments; the

primary sensorium is present in one antenna and absent from the other. In an alate vivipara of *Nasonovia ribisnigri* (Mosley) (Fig. 14) (on *Lactuca sativa* L., Spain, intercepted at New York, New York, 1-V-1967, F. Planer), one cornicle is  $\frac{1}{2}$  the length of the normal one and tapers gradually to an acute, closed tip; its distal portion is devoid of imbrications. In an apterous vivipara of *Dactynotus sonchi* (Geoffroy) (Fig. 15)

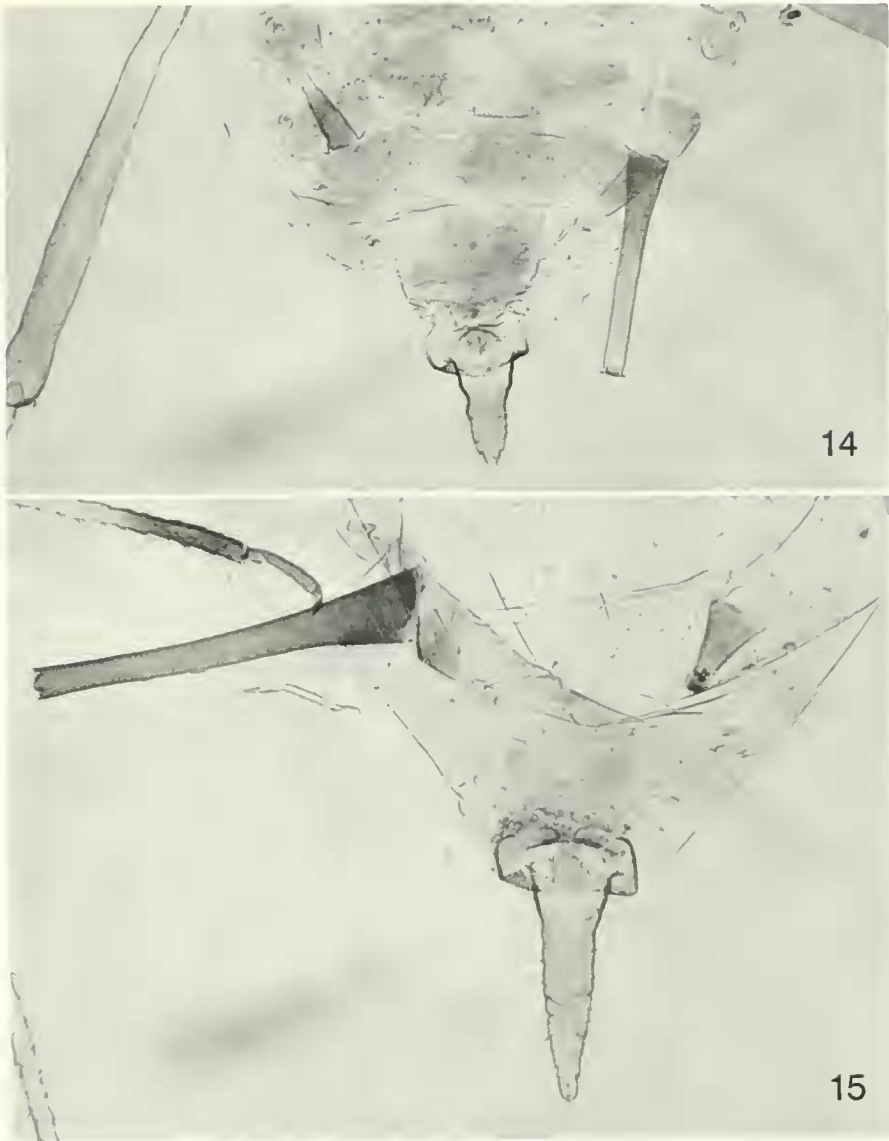


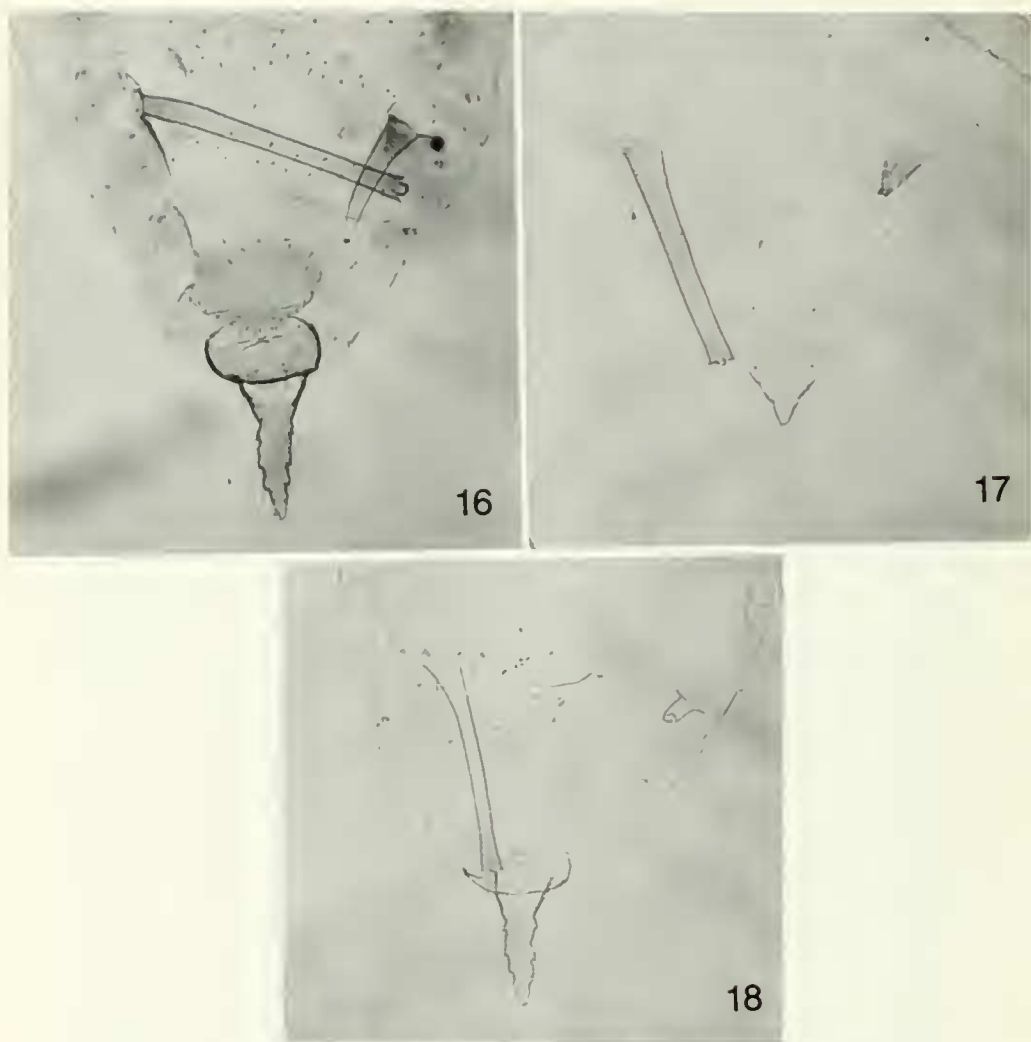
Fig. 14. *Nasonovia ribisnigri*. Alate vivipara with one cornicle shortened and tapered.

Fig. 15. *Dactynotus sonchi*. Apterous vivipara with one cornicle shortened and knobbed apically.

(on *Sonchus oleraceus* L., Honolulu, Hawaii, 20-VI-1975, R. Mau), one cornicle is  $\frac{1}{4}$  the length of the normal one, tapers, then enlarges and terminates in a knob; the presence or absence of a terminal opening cannot be determined because of debris. The cornicle has imbrications but lacks reticulations.

In two specimens of *Acyrtosiphon kondoi* Shinji (on *Medicago sativa* L., Quetta Valley, Pakistan, 19-VI-1978, S. Hamid), one cornicle in an alate vivipara (Fig. 16) is about  $\frac{1}{2}$  the length of the normal one and is constricted near its fingerlike end which has a small opening but no flange. In an alatoid nymph (Fig. 17), one greatly abbrev-



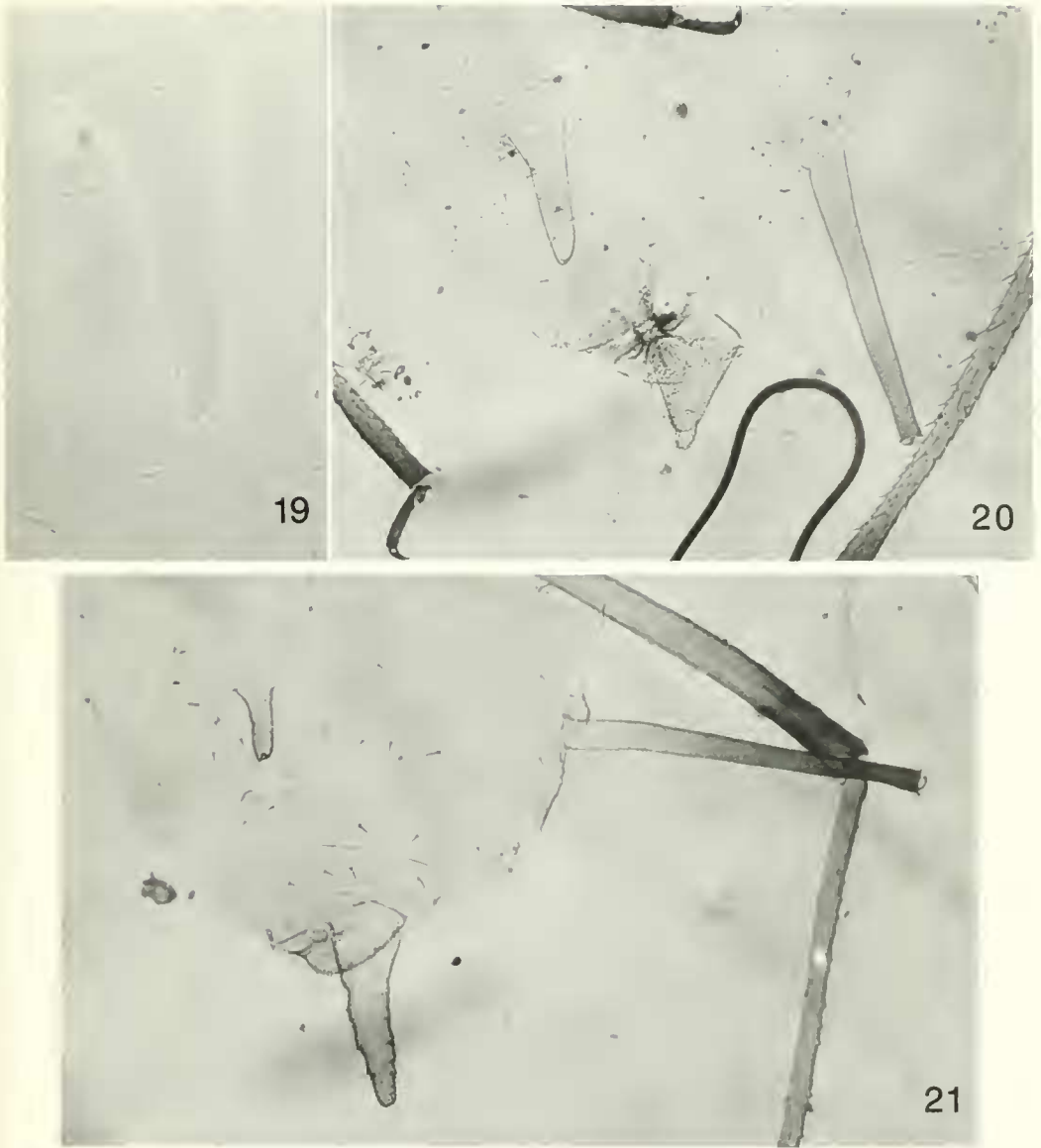


Figs. 16–18. *Acyrthosiphon kondoi*. 16, Alate vivipara with one cornicle shortened and tapered. 17, Alate nymph from same collection with one cornicle dwarfed and bearing a stublike protrusion on its distal margin. 18, Alate vivipara with one cornicle greatly dwarfed.

viated cornicle lacks imbrications and a flange; it has a stublike extrusion on its distal margin. And in another alate vivipara of *A. kondoi* (Fig. 18) (on *Medicago sativa* L., St. George, Utah, 11-V-1975, D. Huber), one cornicle is a stub no longer than the basal diameter of the normal cornicle; it has few imbrications and an apical opening but it lacks a flange.

In an apterous intermediate of *Macrosiphum euphorbiae* (Thomas) (Fig. 20) (on

*Rosa* sp., England, intercepted at Philadelphia, Pennsylvania, 10-VI-1964, F. Harvey and N. Arehart), one cornicle is about  $\frac{1}{2}$  the length of the normal one, tapers slightly to a rounded, closed apex, and has few imbrications but no reticulations. There is a transverse, oblong opening on its dorsal surface (Fig. 19). This specimen has an atypical cauda, the apex of the abdomen resembling that of a nymph instead of an adult. In an alate vivipara of *M. euphorbiae* (Fig. 21)



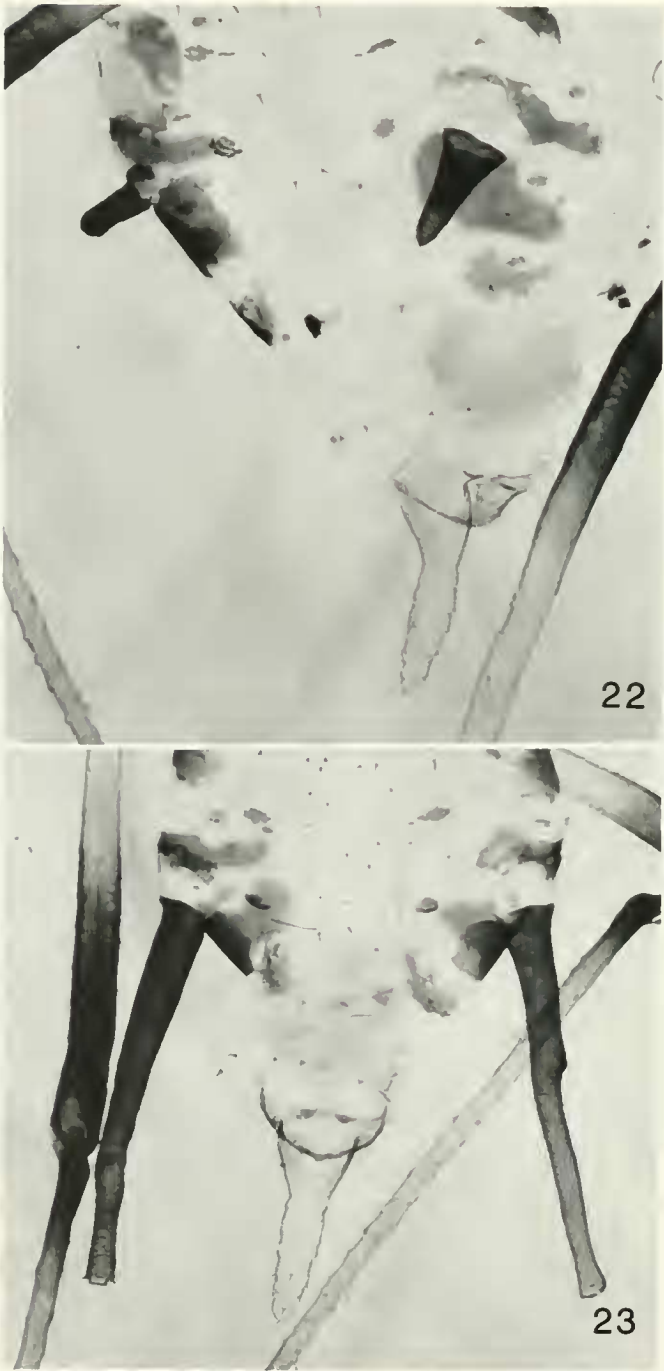
Figs. 19-21. *Macrosiphum euphorbiae*. 19, Abnormal cornicle of apterous intermediate enlarged to show hole in its upper surface. 20, Apterous intermediate with one cornicle modified. 21, Alate vivipara with one cornicle dwarfed.

(from yellow pan trap, Beltsville, Maryland, 10-X-1975, W. W. Cantelo), a cornicle dwarfed to about  $\frac{1}{4}$  normal length has few imbrications, no reticulations and a small apical opening without a flange.

Two alate viviparae of *Macrosiphum rosae* (L.) (on greenhouse roses, New Bruns-

wick, New Jersey, 28-X-1975, H. T. Streu) have modified cornicles and antennae. In one specimen (Fig. 22), the cornicles are greatly shortened and their ends are closed; one tapers gradually and is pointed apically while the other is of nearly uniform diameter and is rounded apically; both have few





Figs. 22-23. *Macrosiphum rosae*. 22, Alate vivipara with both cornicles dwarfed and mis-shaped. 23, Alate vivipara from same collection with both cornicles atypical in shape.



Fig. 24. *Aphis sambucifoliae*. Alate vivipara with three cornicles, one greatly reduced in size proximal of a normal one.

Fig. 25. *Euceraphis punctipennis*. Alate vivipara with four cornicles, the anterior pair normal, the posterior pair supplementary.

imbrications and no reticulations. In this insect, one antenna terminates and is weakly nipplelike at the end of the fourth segment; the other antenna is slightly shorter and is curved with an invagination at its

end. In the other specimen (Fig. 23), one of the unusually slender cornicles is narrowed abruptly, has four indistinct rows of reticulations, an abnormal apical opening, and no flange. The other cornicle, narrowed nearer

the distal end, has 10 distinct rows of reticulations, a normal opening, and a flange. In the latter aphid, one antenna is aborted at the distal end of the third segment, and the other antenna has only the proximal portion of the fourth segment; apices of both antennae are rounded.

Malformations similar to, or varying slightly from, those discussed are present in other specimens.

#### SPECIES WITH THREE CORNICLES

Remaudière (1964) noted the presence of three cornicles on nymphs and adults of *Aphis* sp. near *esulae* Boerner. Of 19 specimens studied, two adults and six nymphs had three cornicles. Medler and Ghosh (1967) noted three cornicles on an alate vivipara of *Macrosiphum* sp. Russell (1975) observed three cornicles on an alate vivipara of *Aphis sambucifoliae* Fitch (Fig. 24) (prey of Asilidae, Baltimore County, Maryland, VIII-1973, A. G. Scarbrough). The additional cornicle is shorter and narrower than the other two and is nearly devoid of imbrications; the apical opening is replaced by a conical invagination and there is no flange.

#### SPECIES WITH FOUR CORNICLES

Remaudière (1964) found four cornicles in three nymphs of *Aphis* sp. near *esulae* Boerner, while two adults and six nymphs also in his collection had only the normal pair of cornicles. Leonard (1967) observed a pair of adventitious cornicles on an apterous vivipara of *Aphis sambucifoliae* Fitch. Russell (1975), who recorded four cornicles in an alate vivipara of *Euceraphis punctipennis* (Zetterstedt) (Fig. 25) (on *Betula* sp., Mesa, Colorado, 8-VI-1967, F. C. Hottes), stated ". . . it is the only one of 80 individuals of the lot that exhibits a duplication of cornicles." The adventitious cornicles appear to differ from the typical pair only in their smaller size. In all specimens, the additional cornicles are located on the sixth abdominal segment, posterior to, and usually slightly proximad of, the normal pair.

#### BRANCHED CORNICLES

Zirnitz (1930) recorded conspicuous branching of cornicles in apterous viviparae of *Megoura viciae* Buckton. Perhaps the stublike extrusion we observed on the aborted cornicle of a nymph of *Acyrtosiphon kondoi* (Fig. 17) exhibits this anomaly.

Branched and supernumerary cornicles are seen less frequently than cornicles modified in size, shape and other characteristics.

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